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| 10/830,164 | 04/21/2004 | Srikanth R. Avadhanam | MS167378.02/40062.128USC1 | 8149 |

7590 12/11/2006

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EXAMINER

CHANNAVAJJALA, SRIRAMA T

ART UNIT PAPER NUMBER

2166

DATE MAILED: 12/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/830,164

Applicant(s)

AVADHANAM ET AL.

Examiner

Srirama Channavajjala

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 April 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date <u>12/21/04&11/17/06</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This application is a continuation of US Application No. **09/838,691** filed on **4/19/2001** is now US Patent No. **6,778,977**
2. Claims 1-28 are pending in this application.

Drawings

3. Drawings filed on 4/21/2004 is acceptable for examination purpose.

Information Disclosure Statement

4. The information disclosure statement filed on 12/21/2004 and 11/17/2006 is in compliance with the provisions of 37 CFR 1.97, and has been considered and a copy is enclosed with this Office Action.

Specification

5. At page 13, line 23, page 35, line 4, US Application sl. No. 09/652,942 required update the status of the application.
6. Applicant has incorporated by reference US Application 09/652,942, at page 1 and page 23 of the specification. Examiner notes that incorporation by reference of an application in a printed United States patent constitutes a special circumstance under 35 U.S.C. § 122 warranting that access of the original disclosure of the application be granted. The incorporation by reference will be interpreted as a waiver of confidentiality

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of only the original disclosure as filed, and not the entire application file, *In re Gallo*, 231 USPQ 496 (Comm'r Pat. 1986). If Applicant objects to access to the entire application file, two copies of the information incorporated by reference must be submitted along with the objection. Failure to provide the material within the period provided will result in the entire application (including prosecution) being made available to petitioner. The Office will not attempt to separate the noted materials from the remainder of the application. Compare *In re Marsh Engineering Co.*, 1913 C.D. 183 (Comm'r Pat. 1913).

Claim Rejections - 35 USC § 112

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 1-28 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

9. The metes and bound of the method steps of claim 1 are unclear. In claim 1, although database table of records cited, the steps of the method do not actually partition database table[s] indexes, because "data structure" [if any] is not defined. The steps of "determining", "accessing", "filtering", "independently creating", "merging" are indefinite as they lack concrete active limitations as to how the steps are to be accomplished. One of skill in the art would not be able to determine what exactly must

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be done to accomplish the goal of the preamble. It is unclear how the "processing unit determines which records to keep" and "create final index related to the table".

10. The limitation of claim 2 does not appear to be a further process step and does not appear to further limit the method of claim 1. It is unclear how "sorting the records and generating a data structure based on the sorted records". Claim 1 recites "accessing", "filtering", "independently creating", "merging", but not "data structure".

11. The limitation 5, is not directed to "merging....", but appears to be a limitation of "clustered index" that have already been merged. Therefore, the steps of the claim do not meet the goal of the preamble of the independent claim. It is unclear what is meant by "clustered index"

12. The limitation of claim 6 does not appear to be a further method step and does not appear to further limit the method of claim 1. It is unclear what is meant by "gathering sub-index statistical information and stitching sub-index statistical information".

13. In claim 7, it is unclear what "index creation manager module" means in relation to the method of claim 1. How is "initiated by index creation manager module" created while "merging the sub-indexes.....table" in claim 1. The limitation lacks positive active steps to be taken in the "initiated by an index creating manager module"

14. Claims 8-9 rejected in the above analysis of claim 7.
15. In claim 10, it is unclear how "sampling the table recordskey filed", without defining "key field", further it is not clear what "key field" means?
16. In claim 11, it is unclear where to add the limitations of claim 11 to the claim 10. It is unclear what is meant by "adjusting the processor goal"?
17. The limitations of claims 12-13 are unclear, as the limitations do not set forth concrete, tangible" active steps to be performed in execution of the method in claim 1. How is the "determining processor goal", "determining whether the histogram information" performed? The limitations of claim 11 are confusing and do not clearly meet the goal of the preamble.
18. Claims 14 through 26 are rejected in the analysis of above.
19. In claim 27, Applicant appear to be invoking 112, sixth paragraph "means for" type language, but it is unclear what "structure[s]" are being used to perform the functions "sampling", "accessing", "filtering", "creating", and "merging". The claim does not require any databases, hardware, software, input, output etc. The claims merely require "means-for"...manipulating the structure?. One of skill in the art would not be

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apprised of what structure[s] are intended to be encompassed by the claim[s]. Nor would it be clear what the structure[s] are intended to accomplish.

20. Claim 28 is also recite the "means for allocating memory" language without having specific structure[s] in the specification for implementing the functions.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

21. ***Claims 1-28 are rejected under 35 U.S.C. 101 because invention is directed to non-statutory subject matter.***

As set forth in MPEP 2106(II)A:

Identify and understand Any Practical Application Asserted for the Invention. The claimed invention as a whole must accomplish a practical application. That is, it must produce a "useful, concrete and tangible result." State Street, 149 F.3d at 1373, 47USPQ2d at 1601-02. The purpose of this requirement is to limit patent protection to inventions that possess a certain level of "real world" value, as opposed to subject matter that represents nothing more than an idea or concept, or is simply a starting point for future investigation or research (Brenner v. Manson, 383 U.S. 519, 528-36, 148 USPQ 689, 693-96); In re Ziegler, 992, F.2d 1197, 1200-03, 26 USPQ2d 1600,1603-06

(Fed. Cir. 1993)). Accordingly, a complete disclosure should contain some indication of the **practical application** for the claimed invention, i.e., why the applicant believes the claimed invention is useful.

Apart from the utility requirement of 35 U.S.C. 101, usefulness under the patent eligibility standard requires significant functionality to be present to satisfy the useful result aspect of the practical application requirement. See *Arrhythmia*, 958 F.2d at 1057, 22 USPQ2d at 1036. Merely claiming nonfunctional descriptive material **stored in a computer-readable medium does not make the invention eligible for patenting.** For example, a claim directed to a word processing **file stored on a disk may satisfy the utility** requirement of 35 U.S.C. 101 since the information stored may have some **"real world"** value. However, the mere fact that the claim may satisfy the utility requirement of 35 U.S.C. 101 **does not mean that a useful result is achieved under the practical application requirement. The claimed invention as a whole must produce a "useful, concrete and tangible" result to have a practical application.**

22. Regarding claim 1, "A method of creating an index for a database table of records, the method occurring in a computer environment having a plurality of processing units wherein each processing unit has access to the table, the method comprising:

determining partition delimiters, each partition delimiter separating the table into non-overlapping partitions of records, each partition dedicated to one processing unit for index creation;

accessing the table records in parallel, wherein each processing unit accesses each of the records;

filtering the accessed records in parallel, wherein each processing unit determines which records to keep;

independently creating a plurality of sub-indexes, wherein at least two sub-indexes are created by different processing units; and

merging the sub-indexes together to create, a final index related to the table” is directed to “abstract idea” because all of the elements in the claim 1 would reasonably be interpreted by one of ordinary skill in light of the disclosure page 5, line 5-16, page 10-11, page 16, line 1-10, page 18, line 14-23, page 19, line 1-20, page 20, line 22-23, page 21-page 23, page 25, line 5-23, page 29, line 4-14, page 30, line 3-23, page 31, line 16-23, page 32-33, page 34, line 1-3 as software [merely algorithm], such that the method is software, per se, is “non-statutory subject matter” [see Interim Guidelines page 55-57] and **claim 1**, do not have “practical application” because the “final result” by the claimed invention in the claim 1, elements particularly

“determining partition delimiters, each partition delimiter separating the table into non-overlapping partitions of records, each partition dedicated to one processing unit for index creation;

independently creating a plurality of sub-indexes, wherein at least two sub indexes are created by different processing units; and

merging the sub-indexes together to create, a final index related to the table”

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is not producing "useful, and concrete" results or output and therefore, claim 1, is a non-statutory subject matter [see Interim Guidelines page 55-57]. The claimed invention is subject to the test of State Street, 149 F.3d at 1373-74, 47 USPQ2d at 1601-02.

Specifically State Street sets forth that the claimed invention must produce a "*useful, concrete and tangible result*." The Interim Guidelines for Examination of Patent

Applications for Patent Subject Matter Eligibility states in section IV C. 2 b. (2)

(on page 21 in the PDF format):

The tangible requirement does not necessarily mean that a claim must either be tied to a particular machine or apparatus or must operate to change articles or materials to a different state or thing. However, the tangible requirement does require that the claim must recite more than a § 101 judicial exception, in that the process claim must set forth a practical application of that § 101 judicial exception to produce a real-world result. Benson, 409 U.S. at 71-72, 175 USPQ at 676-77 (invention ineligible because had "no substantial practical application.").

[If] Claim 1, have the result of producing results related to "*determining partition delimiters, each partition delimiter separating the table into non-overlapping partitions of records, each partition dedicated to one processing unit for index creation;*

independently creating a plurality of sub-indexes, wherein at least two sub indexes are created by different processing units; and

merging the sub-indexes together to create, a final index related to the table"

however the claim[s] do not specify [a]: satisfying proper condition[s]; [b] that the result neither stored , or output or at least displayed to a user or otherwise used in the real world, but merely merging....to create a final index related to the table.

The examiner reviewed the specification page 5, line 5-16, page 10-11, page 16, line 1-10, page 18, line 14-23, page 19, line 1-20, page 20, line 22-23, page 21-page

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23page 25, line 5-23,page 29, line 4-14,page 30, line 3-23, page 31, line 16-23, page 32-33, page34, line 1-3 but was unable to find a practical real-world use of the result (***“determining partition delimiters, each partition delimiter separating the table into non-overlapping partitions of records, each partition dedicated to one processing unit for index creation;***

independently creating a plurality of sub-indexes, wherein at least two sub indexes are created by different processing units; and

merging the sub-indexes together to create, a final index related to the table”)

If the applicant is able to find one and inserts it into the claims provide the location the element is found in the specification

claims 14,18,24,27 are rejected in the analysis of above claim 1.

At best, the steps of claim 1 appear to provide partition delimiter to create index[s] or sub-index[s], accessing records from table, filtering records, creating sub-indexes and merging sub-indexes to create final index is merely manipulating “data structure” or software routines [merely algorithm] has no intrinsic meaning, value, or usefulness. The results must be further manipulated or interpreted by the user to be useful. Therefore, this method of creating an index for a database table in claim 1,14,18,27 is not statutory. See MPEP 2106: “For such subject matter to be statutory, the claimed process must be limited to a practical application of the abstract idea or mathematical algorithm” See Alappat, 33 F.3d 1543, 31 USPQ2d at 1556-57 (quoting Diamond v Diehr, 450 U.S at 192,209 USPQ at 10). See also Alappat 33 F.3d at

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1569,31 USPQ2d at 1578-79 (Newman,J., concurring) (“unpatentability of the principle does not defeat patentability of its practical applications”) (citing O ‘Reilly v Morse, 56 (15 How.) at 114-19). A claim is limited to a practical application when the method, as claimed, produces a concrete, tangible and useful result; i.e. the method or system or apparatus recites a step or act of producing something that is concrete, tangible and useful. See AT&T, 172 F.3d at 1358, 50 USPQ2d at 1452”.

23. Regarding claim 20, A method of creating an index for a database table of records, the method occurring in a computer environment having a plurality of processing units wherein more than one processing unit has access to the table, the method comprising:

determining partition delimiters, each partition delimiter separating the table into non-overlapping partitions of records, each partition dedicated to one processing unit for index creation;

independently creating a plurality of sub-indexes, wherein at least two sub indexes are created by different processing units;

allocating blocks of a disk to store each sub-index, wherein parts of each sub-index are stored on consecutive blocks on the disk; and

merging the sub-indexes together to create a final index related to the table”
is directed to “abstract idea” because all of the elements in the claim 20 would reasonably be interpreted by one of ordinary skill in light of the disclosure page 5, line 5-16, page 10-11, page 16, line 1-10, page 18, line 14-23, page 19, line 1-20, page 20, line

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22-23, page 21-page 23page 25, line 5-23,page 29, line 4-14,page 30, line 3-23, page 31, line 10-23, page 32-33, page34, line 1-3 as software [merely algorithm], such that the method is software, per se , is “non-statutory subject matter” [see Interim Guidelines page 55-57] and **claim 20** do not have “practical application” because the “final result” by the claimed invention in the claim 1, elements particularly

“determining partition delimiters, each partition delimiter separating the table into non-overlapping partitions of records, each partition dedicated to one processing unit for index creation;

independently creating a plurality of sub-indexes, wherein at least two sub indexes are created by different processing units;

allocating blocks of a disk to store each sub-index, wherein parts of each sub-index are stored on consecutive blocks on the disk; and

merging the sub-indexes together to create a final index related to the table” is not producing “useful, and concrete” results or output and therefore, claim 20, is a non-statutory subject matter [see Interim Guidelines page 55-57]. The claimed invention is subject to the test of State Street, 149 F.3d at 1373-74, 47 USPQ2d at 1601-02.

Specifically State Street sets forth that the claimed invention must produce a “*useful, concrete and tangible result.*” The Interim Guidelines for Examination of Patent

Applications for Patent Subject Matter Eligibility states in section IV C. 2 b. (2)

(on page 21 in the PDF format):

The tangible requirement does not necessarily mean that a claim must either be tied to a particular machine or apparatus or must operate to change articles or materials to a different state or thing. However, the tangible requirement does require that the claim must recite more than a § 101 judicial exception, in that the process claim must set forth a practical application of that § 101 judicial exception to produce a real-world

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result. Benson, 409 U.S. at 71-72, 175 USPQ at 676-77 (invention ineligible because had "no substantial practical application.").

[If] Claim 20, have the result of producing results related to "determining partition delimiters, each partition delimiter separating the table into non-overlapping partitions of records, each partition dedicated to one processing unit for index creation;

independently creating a plurality of sub-indexes, wherein at least two sub indexes are created by different processing units;

allocating blocks of a disk to store each sub-index, wherein parts of each sub-index are stored on consecutive blocks on the disk; and

merging the sub-indexes together to create a final index related to the table" however the claim[s] do not specify [a]: satisfying proper condition[s]; [b] that the result neither stored , or output or at least displayed to a user or otherwise used in the real world, but merely merging....to create a final index related to the table.

The examiner reviewed the specification page 5, line 5-16, page 10-11, page 16, line 1-10, page 18, line 14-23, page 19, line 1-20, page 20, line 22-23, page 21-page 23, page 25, line 5-23, page 29, line 4-14, page 30, line 3-23, page 31, line 10-23, page 32-33, page 34, line 1-3 but was unable to find a practical real-world use of the result ("determining partition delimiters, each partition delimiter separating the table into non-overlapping partitions of records, each partition dedicated to one processing unit for index creation;

independently creating a plurality of sub-indexes, wherein at least two sub indexes are created by different processing units;

allocating blocks of a disk to store each sub-index, wherein parts of each sub-index are stored on consecutive blocks on the disk; and

merging the sub-indexes together to create a final index related to the table")

If the applicant is able to find one and inserts it into the claims provide the location the element is found in the specification

24. In view of Applicant's disclosure, specification page 5, line 20-23, page 8, line 19-23, page 9, line 1-4, the medium is not limited to tangible embodiments, instead being defined as including both e.g., Memory, removable storage, non-removable storage, RAM,ROM,EEPROM, flash memory, CD-ROM, DVD, optical storage, magnetic cassettes, magnetic tape, magnetic disk storage) and e.g., at page 5, line 20-23 including propagated signal on a carrier readable by a computing system and encoding a computer program of instructions for executing a computer process; page 8, line 20-23 [for example] computer readable instructions, data structures, program modules or other data in a modulated data signal such as a carrier wave or other transport mechanism...). As such, the claim is not limited to statutory subject matter and is therefore non-statutory.

Hence, claims 12-13 depend from claim 1, 11 are rejected under 35 USC 101 as “non-statutory” because computer program product[s] that lack storage on a suitable computer-readable medium are not able to realize any functionality and are thus not statutory

claim 12 is directed to “***A computer program product readable by a computer and encoding instructions for executing the method recited in claim 1***”

claim 13 is directed to “***A computer program product readable by a computer and encoding instructions for executing the method recited in claim 11***”

finally, “**CARRIER WAVES , propagated signal** on a **carrier ARE NOT STATUTORY**”

REMARKS: applicant is required to amend the specification page 5, line 20-23, page 8, line 19-23, page 9, line 1-4 appropriately

For “General Analysis for Determining Patent-Eligible Subject Matter”, see 101 Interim Guidelines as indicated below:

<<<http://www.uspto.gov/web/offices/pac/dapp/oqsheet.html>>>

see MPEP 8th edition, Rev 5, Aug 2006

No new matter should be entered

Double Patenting

25. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

26. Claims 1-28 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 18 of U.S. Patent No. **6,778,977**. Although the conflicting claims are not identical, they are not patentably distinct from each other because the instant application [10/830,164] claims 1,4,20,27 are directed to:

A method of creating an index for a database table of records, the method occurring in a computer environment having a plurality of processing units wherein each processing unit has access to the table, the method comprising:

determining partition delimiters, each partition delimiter separating the table into non-overlapping partitions of records, each partition dedicated to one processing unit for index creation;

accessing the table records in parallel, wherein each processing unit accesses each of the records;

filtering the accessed records in parallel, wherein each processing unit determines which records to keep;

independently creating a plurality of sub-indexes, wherein at least two sub-indexes are created by different processing units; and

merging the sub-indexes together to create, a final index related to the table"

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while US Patent **6,778,977** is directed to:

“A method of creating an index for a database table of records, the method occurring in a computer environment having a plurality of processing units wherein each processing unit has access to the table, the method comprising:

determining partition delimiters, each partition delimiter separating the table into non-overlapping partitions of records, each partition dedicated to one processing unit for index creation;

independently creating a plurality of sub-indexes, wherein at least two sub-indexes are created by different processing units;

gathering sub-index statistical information and stitching sub-index statistical information, wherein gathering sub-index statistical information, comprises: evaluating record field information;

generating a histogram relating to the evaluation of the record field information;

creating a linked list of data objects related to the histogram;

determining variance values between consecutive data objects and storing the variance values in a heap; and

reducing the linked list by combining data objects having a relatively low variance value between the respective data objects; and

merging the sub-indexes together to create a final index related to the table”

It would have been obvious to one of the ordinary skill in the art at the time of the applicant's invention to modify the steps as indicated in claim 1,14,20,27 of the instant

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application since the omission and addition of the limitations would have not changed index for a database table of records particularly access to the table that determining partition delimiters, independently creating sub-indexes, gathering sub-index information, filtering the records and merging the sub-indexes to create final index.

Therefore, the ordinary skilled artisan would have been also motivated to modify claim 1,14,20,27 of the instant US application by substituting the steps of ***determining partition delimiters, each partition delimiter separating the table into non-overlapping partitions of records, each partition dedicated to one processing unit for index creation; accessing the table records in parallel, wherein each processing unit accesses each of the records; filtering the accessed records in parallel, wherein each processing unit determines which records to keep; independently creating a plurality of sub-indexes, wherein at least two subindexes are created by different processing units; and merging the sub-indexes together to create, a final index related to the table***” with the steps of ***determining partition delimiters, each partition delimiter separating the table into non-overlapping partitions of records, each partition dedicated to one processing unit for index creation; independently creating a plurality of sub-indexes, wherein at least two sub-indexes are created by different processing units; gathering sub-index statistical information and stitching sub-index statistical information, wherein gathering sub-index statistical information, comprises: evaluating record field information; generating a histogram relating to the evaluation of the record field information; creating a linked list of data objects related to the histogram; determining variance values between***

consecutive data objects and storing the variance values in a heap; and reducing the linked list by combining data objects having a relatively low variance value between the respective data objects; and ***merging the sub-indexes together to create a final index related to the table***". The cited omitting elements would not interfere with the functionality of the steps previously claimed and would perform the same function. In re Karlson, 136 USPQ 184 (CCPA 1963)

Instant application:

US Patent 6,778,977

| | |
|----------|---------------------|
| Claim 2 | claim 2 |
| Claim 3 | claim 3 |
| Claim 4 | claim 4 |
| Claim 5 | claim 5 |
| Claim 6 | claim 6 [pre-amble] |
| Claim 7 | claim 12 |
| Claim 8 | claim 13 |
| Claim 9 | claim 14 |
| Claim 10 | claim 15 |
| Claim 11 | claim 16 |
| Claim 12 | claim 17 |
| Claim 13 | claim 18 |

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Claim Rejections - 35 USC § 103

27. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

28. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

29. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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30. Claims 1- 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta et al. [hereafter Gupta], US Patent No. 6438562 filed on August 24,1999 in view of Blank et al. [hereafter Blank], US Patent No. 5,842,208 published on Nov 24, 1998.

31. As to claim 1, 12, 18,20,27, Gupta teaches a system which including 'a method of creating an index for a database table of records[col 2, line 21-23, col 3, line 45-47 fig 2-3], database table corresponds to fig 2, table 200; index corresponds to fig 3, element 300 the method occurring in a computer environment having a plurality of processing units [fig 1, fig 7] wherein each processing unit has access to the table [col 2, line 41-44], Gupta specifically teaches relational storage where relational databases store data records in indexed tables as detailed in fig 2-3, plurality of processing units corresponds to Gupta's fig 1 and fig 7 ;

determining partition delimiters, each partition delimiter separating the table into non-overlapping partitions of records [col 14, line 35-38, fig 7], each partition delimiter separating the table into non-overlapping partitions of records corresponds to Gupta's fig 7, partitions A 161, B162, and C 163; 'each partition dedicated to one processing unit for index creation' [col 14, line 44-50, line 54-56], each partition dedicated to one processing unit for index creation corresponds to Gupta's index fig 7, element 711,712,713, and 714 ;

accessing the table records in parallel, wherein each processing unit accesses each of the records [col 8, line 1-13], Gupta teaches data manipulation operations

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specifically each data slave accessed to perform data manipulation i.e., processing data records and updating the index maintenance records as detailed in col 8, line 1-13;

filtering the accessed records in parallel, wherein each processing unit determines which records to keep [col 7, line 45-51; col 12, line 21-27, col 13, line 37-39], Gupta specifically teaches accessing index ID value that identifies the specific index associated with the data records to be changed as detailed in col 12, line 21-27

independently creating a plurality of sub-indexes, wherein at least two sub-indexes are created by different processing units' [col 3, line 45-52, col 12, line 58-63, line 64-67, col 13, line 18-25, col 14, line 54-61], Gupta specifically teaches each index record corresponds to a row [see fig 6], further index maintenance records indicate changes that need to be made to indexes in response to changes that are made to the table [col 12, line 58-63], that corresponds to independently creating indexes or sub-indexes, further to keep separate the changes to the two indexes, the index maintained records are modified to include the index ID as detailed in fig 6, element 611. It is also noted that sub-indexes are part of B-tree element 300 because B-tree is arranged in hierarchical structure, further each node or branch in the B-tree structure associated with index key [col 3, line 45-53]

It is however, noted that Gupta does not specifically teach 'merging the sub-indexes together to create, a final index related to the table', although Gupta specifically teaches coordinating an update of a global index of an indexed table and updates the global index using the current index maintenance record [col 7, line 41-42],

further Gupta also suggests index maintenance records using "data manipulation operations among parallel data manipulation slaves for example fig 5, element 510, the data manipulation operations including updating col 14, line 46-47] , inserting, deleting [col 13, line 28] sorting [col 16, line 36-37]and like

On the other hand, Blank et al. disclosed 'merging the sub-indexes together to create, a final index related to the table' col 3, line 57-67, col 4, line 1-2], Blank specifically teaches index built system that supports multiple scan program performed in parallel by multiple processors against multiple partitions [see fig 3], further, in the processing or recover/built index system, multiple merge programs for example fig 4, element 112a-b are performed that merges all the key/rid values. Finally, an index built program 114 is performed to built final index element 116as detailed in fig 1.

It would have been obvious to one of the ordinary skill in the art at the time of applicant's invention to incorporate the teachings of Blank et al. into parallel index maintenance of Gupta et al. because, both Gupta and Blank are directed to "multiple processors and multiple partitions of database tables [see Gupta fig 1, fig 7; Blank: fig 1, element 102 corresponds to multiple processors, element 120 corresponds to partition], both Gupta and Blank also teaches "indexing and index key [see Gupta: fig 2, col 13, line 26-40; Blank: col 2, line 42-48] and both Gupta and Blank specifically suggests "sort" operation [see Gupta: col 16, line 31-33; Blank: col 3, line 18-19] and both are from same field of endeavor.

One of the ordinary skill in the art at the time of applicant's invention to incorporate the teachings of Blank et al. into parallel index maintenance of Gupta et al. because that would have allowed user's of Gupta et al. to use "sort program that executing in parallel receive the san streams for each "partition to create sort stream [col 3, line 5-9], while merge program that merges the sort stream received from the sort program to create a merge stream [col 3, line 10-15], further merge program built "final indexes" col 3, line 67, col 4, line 1-2] bring the advantages of "high performance recover/build index system that reduces the amount of time that takes to built index in multiple processors [col 3, line 25-27], furthermore, piping the data between the sort and merge programs improves performance of the system as suggested by Blank et al. [col 3, line 28-30],

32. As to claim 2, Gupta disclosed 'wherein the act of creating the sub-indexes [col 3, line 45-53], sub-indexes are part of B-tree element 300 because B-tree is arranged in hierarchical structure, further each node or branch in the B-tree structure associated with index key [col 3, line 45-53] further comprises sorting the records and generating a data structure based on the sorted records [col 8, line 18-26].

33. As to claim 3, Gupta disclosed wherein the data structure is a B-Tree data structure [col 3, line 45-448, col 4, line 13-14], B-structure data structure corresponds to Gupta's B-tree fig 3, element 300.

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34. As to claim 4, Gupta disclosed 'wherein the data structure has multiple levels. [fig 3, element 300, col 4, line 13-15], B-tree data structure is a hierarchical having root node, leaf nodes

35. As to claim 5, Gupta disclosed 'wherein the data structure is a clustered index' [col 14, line 23-26], Gupta specifically teaches index will be clustered based on index maintenance records

36. As to claim 6, Gupta disclosed 'further comprising gathering sub-index statistical information and stitching sub-index statistical information' [col 15, line 35-50, fig 5], Gupta specifically suggests sample of "S" records of the index to give good statistical representation of the population based on number of available nodes as detailed in [col 15, line 35-47].

37. As to claim 7, Gupta disclosed 'wherein the method is initiated by an index creation manager module' [fig 1, element 170, fig 7, element 170], global index corresponds to index module.

38. As to claim 8, Gupta disclosed 'wherein the method is initiated by a query manager in response to a supplied query' [fig 13, col 20, line 66-67, col 21, line 1]

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39. As to claim 9, Gupta disclosed 'wherein the method is initiated automatically in response to a modification to the table' [col 5, line 38-44, col 18, line 53-57, fig 11].

40. As to claim 10, Gupta disclosed 'wherein the act of determining partition delimiters comprises: sampling the table records to determine an approximate distribution of the values in the key field' [col 15, line 35-47, line 66-67, col 16, line 1-13], Gupta specifically teaches sampling of "S" records of the index maintenance records to compute good statistical representation of the population chosen for "S" records, also suggested that every fiftieth record is sampled during the PDML operations, it is also noted that "ranges are defined by reading the "key values" associated with each multiple of S*/N from the sorted records as detailed in fig 8, particularly "distributing work based on index key value ranges" [see col 15]; further it is noted that Gupta also specifically teaches "partitioned" database tables as detailed in fig 1 and fig 7, creating a histogram based on the sampled information; and evaluating the histogram to determine the partition delimiters [col 15, line 39-40].

As best understood by the examiner, a histogram can be constructed by segmenting the range of the data into equal sized, particularly, ranges that are defined in col 15, line 66-67, moreover, it is common knowledge that statistics analyzing, viewing the data in a variety of ways, one possible way is "histogram", "bar graphs", "pie-charts", further, "histograms are sometimes referred to "frequency distribution"

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which is an integral part of Gupta's "statistical representation of records

[col 15, line 39-40]

41. As to claim 11, 13, Gupta disclosed 'determining a processor goal value based on the number of processors in the computer system' [col 4, line 52-55]; determining a least common multiple value based on the processor goal value [col 6, line 55-59]; 'determining whether the histogram information may be substantially evenly split into the least common multiple value number of partitions' [col 6, line 59-65, col 13, line 57-61]; if so, creating the partition delimiters based on the least common multiple value' [col 13, line 66-67]; and if not, adjusting the processor goal to determine a new least common multiple value to determine partition delimiters' [col 14, line 3-8].

42. As to claim 14, Gupta teaches a system which including 'a system for database table index creation for a database table [fig 1, col 4, line 57-61], database table corresponds to fig 1, database table], the database table stored in memory and comprising a plurality of records [fig 1-2, element 151-153], the system comprising:

a plurality of processing units that respectively accesses the database table in parallel, [fig 1, col 4, line 43-48] the respective processing units accesses each of the records [col 8, line 1-13], Gupta teaches data manipulation operations specifically each data slave accessed to perform data manipulation i.e., processing data records and updating the index maintenance records as detailed in col 8, line 1-13;

and 'filters the accessed records to determine which records to keep'[col 7, line 45-51; col 12, line 21-27, col 13, line 37-39], Gupta specifically teaches accessing index ID value that identifies the specific index associated with the data records to be changed as detailed in col 12, line 21-27;

and wherein the respective processing units creates a sub-index of database table records; [col 3, line 45-52, col 12, line 58-63, line 64-67, col 13, line 18-25, col 14, line 54-61], Gupta specifically teaches each index record corresponds to a row [see fig 6], further index maintenance records indicate changes that need to be made to indexes in response to changes that are made to the table [col 12, line 58-63], that corresponds to independently creating indexes or sub-indexes, further to keep separate the changes to the two indexes, the index maintained records are modified to include the index ID as detailed in fig 6, element 611. It is also noted that sub-indexes are part of B-tree element 300 because B-tree is arranged in hierarchical structure, further each node or branch in the B-tree structure associated with index key [col 3, line 45-53]

It is however, noted that Gupta et al. does not specifically teach 'merge tool that merges the plurality of sub-indices into a final database table index', although Gupta specifically teaches coordinating an update of a global index of an indexed table and updates the global index using the current index maintenance record [col 7, line 41-42], further Gupta also suggests index maintenance records using "data manipulation operations among parallel data manipulation slaves for example fig 5, element 510, the

data manipulation operations including updating col 14, line 46-47] , inserting, deleting [col 13, line 28] sorting [col 16, line 36-37]

On the other hand, Blank et al. disclosed 'merge tool that merges the plurality of sub-indices into a final database table index' col 3, line 57-67, col 4, line 1-2], Blank specifically teaches index built system that supports multiple scan program performed in parallel by multiple processors against multiple partitions [see fig 3], further, in the processing or recover/built index system, multiple merge programs for example fig 4, element 112a-b are performed that merges all the key/rid values. Finally, an index built program 114 is performed to built final index element 116as detailed in fig 1.

It would have been obvious to one of the ordinary skill in the art at the time of applicant's invention to incorporate the teachings of Blank et al. into parallel index maintenance of Gupta et al. because, both Gupta and Blank are directed to "multiple processors and multiple partitions of database tables [see Gupta fig 1, fig 7; Blank: fig 1, element 102 corresponds to multiple processors, element 120 corresponds to partition], both Gupta and Blank also teaches "indexing and index key [see Gupta: fig 2, col 13, line 26-40; Blank: col 2, line 42-48] and both Gupta and Blank specifically suggests "sort" operation [see Gupta: col 16, line 31-33; Blank: col 3, line 18-19] and both are from same field of endeavor.

One of the ordinary skill in the art at the time of applicant's invention to incorporate the teachings of Blank et al. into parallel index maintenance of Gupta et al. because that would have allowed user's of Gupta et al. to use "sort program that executing in parallel receive the san streams for each "partition to create sort stream [col 3, line 5-9], while merge program that merges the sort stream received from the sort program to create a merge stream [col 3, line 10-15], further merge program built "final indexes" col 3, line 67, col 4, line 1-2] bring the advantages of "high performance recover/build index system that reduces the amount of time that takes to built index in multiple processors [col 3, line 25-27], furthermore, piping the data between the sort and merge programs improves performance of the system as suggested by Blank et al. [col 3, line 28-30],

43. As to claim 15, Gupta disclosed 'a filter module that filters the accessed records and selectively predetermined records'[col 7, line 45-51; col 12, line 21-27, col 13, line 37-39], Gupta specifically teaches accessing index ID value that identifies the specific index associated with the data records to be changed as detailed in col 12, line 21-27, col 20, line 66-67, col 21, line 1-4, fig 13] ; and a sorting module that sorts records kept by the filter module into a sub-index' [col 16, line 31-33]. On the other hand, Blank disclosed 'a scanning module that scans the database table' [fig 1, element 108,fig 2, element 200], Blank specifically teaches both scan and sort operations as detailed in fig 2.

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44. As to claim 16, Blank disclosed 'scanning module, filter module and sorting module, for each processing unit, operate concurrently' [fig 1-2,fig 4,col 3, line 55-67].

45. As to claim 17, Gupta disclosed 'a sampling module for sampling the database table and a partition module for dividing the records into substantially equal quantities related to the number of processing units' [col 15, line 35-47].

46. As to claim 19, Gupta disclosed 'upon determining that the accessed table record is not associated with the at least one partition dedicated to the first processing unit, passing the accessed record to the second processing unit for index creation' [col 16, line 34-46].

47. As to claim 21, 25, Gupta disclosed wherein the act of allocating portions of the disk allocates a predetermined number of blocks, the predetermined number of blocks is determined during the determination of the partition delimiters' [col 11, line 61-67, col 12,line 1-7].

48. As to claim 22, 26, Gupta disclosed 'wherein the allocation of portions of the disk comprises: maintaining a cache of allocated pages and allocating pages for each partition in the cache for each processing unit' [col 3, line 6-15, fig 1]

retrieving a pre-determined number of database pages upon request,col 3, line 15-18]

wherein the number of pages to allocate upon each request is determined by the size of the cache [col 3, line 19-26].

49. As to claim 23, Gupta disclosed 'wherein the cache has a size depending on the size of the index being built and the number of currently available free pages in the system' [col 6, line 24-33].

50. As to claim 24, Gupta teaches a system which including 'In a computer system having a plurality of processors' [fig 1, element 111,112,113,114], an index creation system for creating an index of information for a table of data records' [fig 1, element 170]

'a sampling module that samples the table of data records to determine sub index delimiters' [[col 15, line 35-47, line 66-67, col 16, line 1-13], Gupta specifically teaches sampling of "S" records of the index maintenance records to compute good statistical representation of the population chosen for "S" records, also suggested that every fiftieth record is sampled during the PDML operations, it is also noted that "ranges are defined by reading the "key values" associated with each multiple of S^*/N from the sorted records as detailed in fig 8, particularly "distributing work based on index key value ranges" [see col 15]; further it is noted that Gupta also specifically teaches "partitioned" database tables as detailed in fig 1 and fig 7

' two or more index creation modules, each index creation module

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associated with a processor, each index creation module creates a sub-index'

[col 3, line 37-65, col 4, line 13-24];

an access module that accesses data records from the table of data records [col 8, line 1-13], Gupta teaches data manipulation operations specifically each data slave accessed to perform data manipulation i.e., processing data records and updating the index maintenance records as detailed in col 8, line 1-13;

'a filter module that filters data records according the sub-index delimiters to keep only relevant data records' [col 7, line 45-51; col 12, line 21-27, col 13, line 37-39], Gupta specifically teaches accessing index ID value that identifies the specific index associated with the data records to be changed as detailed in col 12, line 21-27

'a sorting module that sorts the relevant data records into a sub-index' [col 3, line 45-53], sub-indexes are part of B-tree element 300 because B-tree is arranged in hierarchical structure, further each node or branch in the B-tree structure associated with index key [col 3, line 45-53] further comprises sorting the records and generating a data structure based on the sorted records [col 8, line 18-26].

It is however noted that Gupta does not specifically teach 'a merge module that merges the sub-indexes into a final index', although Gupta specifically teaches coordinating an update of a global index of an indexed table and updates the global index using the current index maintenance record [col 7, line 41-42], further Gupta also

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suggests index maintenance records using "data manipulation operations among parallel data manipulation slaves for example fig 5, element 510, the data manipulation operations including updating col 14, line 46-47] , inserting, deleting [col 13, line 28] sorting [col 16, line 36-37].

On the other hand, Blank et al. disclosed 'a merge module that merges the sub-indexes into a final index'' col 3, line 57-67, col 4, line 1-2], Blank specifically teaches index built system that supports multiple scan program performed in parallel by multiple processors against multiple partitions [see fig 3], further, in the processing or recover/built index system, multiple merge programs for example fig 4, element 112a-b are performed that merges all the key/rid values. Finally, an index built program 114 is performed to built final index element 116as detailed in fig 1.

It would have been obvious to one of the ordinary skill in the art at the time of applicant's invention to incorporate the teachings of Blank et al. into parallel index maintenance of Gupta et al. because, both Gupta and Blank are directed to "multiple processors and multiple partitions of database tables [see Gupta fig 1, fig 7; Blank: fig 1, element 102 corresponds to multiple processors, element 120 corresponds to partition], both Gupta and Blank also teaches "indexing and index key [see Gupta: fig 2, col 13, line 26-40; Blank: col 2, line 42-48] and both Gupta and Blank specifically suggests "sort" operation [see Gupta: col 16, line 31-33; Blank: col 3, line 18-19] and both are from same field of endeavor.

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51. As to claim 28, Gupta disclosed 'allocating memory for storing parts of each sub-index in contiguous memory blocks' [col 3, line 10-18].

Conclusion


The prior art made of record

a. US Patent. No. 6438562

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Srirama Channavajjala whose telephone number is 571-272-4108. The examiner can normally be reached on Monday-Friday from 8:00 AM to 5:30 PM Eastern Time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alam, Hosain, T, can be reached on (571) 272-3978. The fax phone numbers for the organization where the application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free)

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